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GB 2306915 A      GB 2226525 A      GB 2188592 A  
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US 4649266 A

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(54) Postage meter and postage indicia printed thereby

(57) A postage meter includes a printer operated by electronic means to print postage indicia on mail items. In order to accommodate the required data within the postage indicium, data consisting of multi digits is represented by a lesser number of digits or by a single digit. The electronic means includes conversion means responsive to input of data, for example comprising postage amount and date, each consisting of multi digits which generates representations of that data consisting of a lesser number of digits or a single digit and the electronic means controls the printer to print the generated representation of the data.

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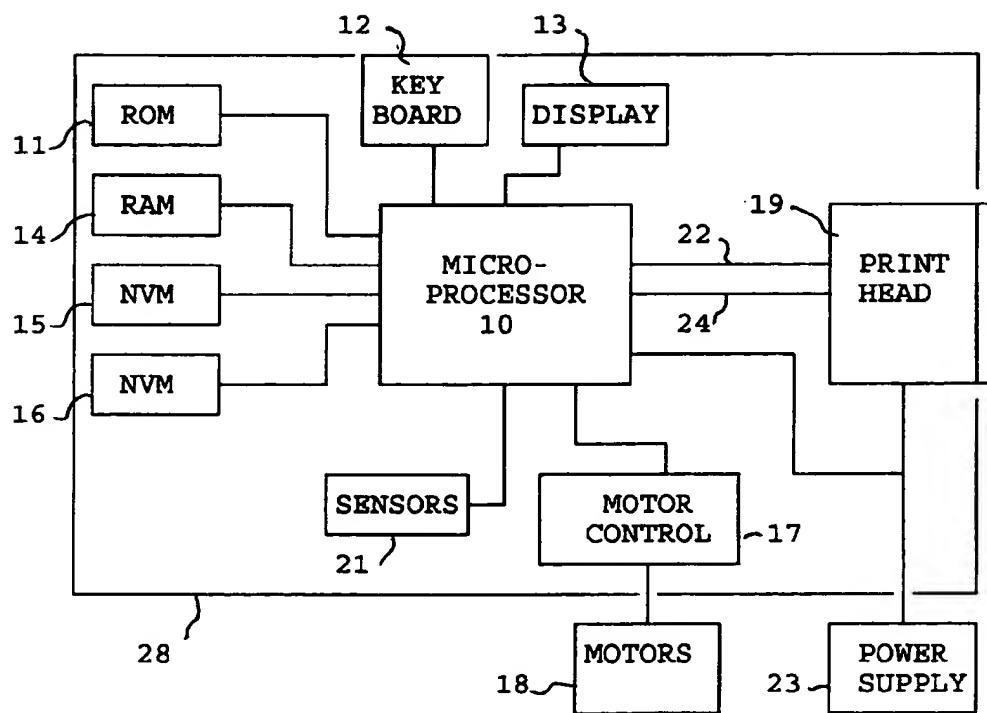


FIGURE 1

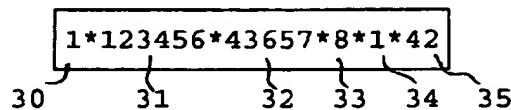


FIGURE 2

## POSTAGE METER AND POSTAGE INDICIA PRINTED THEREBY

This invention relates to postage meters and apparatus for metering postage value in which postage amounts applied in respect of postal items are accounted for and in which the 5 postage meter or apparatus for metering postage value controls printing means to print postage indicia on the postal items.

In currently known and commercially available postage 10 meters an indicium authorised by the appropriate postal authority is printed on each mail item to indicate that the mail item has been franked with a postage amount and that the postage amount has been accounted for by the meter. The postage meter is constructed in a secure 15 manner by being housed in a secure housing and the printing means which prints the indicium is constructed to work integrally with the meter and also is secure. Accordingly the indicia is printed under conditions of security and attempts to operate the meter and printer in 20 a fraudulent manner in which indicia are printed in respect of postage amounts for which accounting has not been effected are prevented.

However in order to provide additional security with 25 respect to the postage amounts applied to mail items it is desirable that the indicia on the mail items include authenticating information whereby the authenticity of the indicia can be verified. By including this authenticating information it is possible, by examination of indicia on 30 mail items, to detect indicia which are not genuine and purport to represent postage charges. No accounting for the postage charges represented by such non-genuine indicia will have been effected so that such indicia have been produced in a manner which results in fraud on the 35 postal authority or other carrier.

According to one aspect of the invention a mail item bears

a postage indicium including multi-digit data represented by a number of digits less than said multi-digit, the representation of said multi-digit data being such that at least a range of value of said data can be distinguished 5 from values of said data outside said range.

According to a second aspect of the invention apparatus for metering postage value and printing postage indicia on mail items includes means operative to represent multi-10 digit data by a number of digits less than said multi-digit and to operate printing means to print an indicium including said data represented by said number of digits.

According to a third aspect of the invention a method of 15 printing a postage indicium includes representing multi-digit data by a number of digits less than said multi-digit and printing the indicium including said data represented by said number of digits.

20 Preferably the multi-digit value is represented by a single digit.

An embodiment of the invention will be described hereinafter by way of example with reference to the 25 drawings in which:-

Figure 1 is a block circuit diagram of a postage meter, Figure 2 illustrates a format of data to be printed in a postage indicium.

30 Referring first to Figure 1 of the drawings, the postage meter includes electronic accounting and control means comprising a micro-processor 10 operating under program routines stored in a read only memory (ROM) 11. A keyboard 12 is provided for input of commands and data by 35 a user and a display 13 is provided to enable display of information to the user. A random access memory (RAM) 14 is provided for use as a working store for storage of

temporary data during operation of the postage meter. Non-volatile duplicated memories 15, 16 are provided for the storage of critical data relating to use of the postage meter and which is required to be retained even 5 when the postage meter is not powered. The microprocessor 10 carries out accounting functions in relation to use of the postage meter for franking mail items with amounts of postage charges applicable to handling of the mail items by the postal authority or another carrier. Accounting 10 data relating to use of the postage meter for printing franking indicia representing postage charges for mail items and any other critical data to be retained is stored in the non-volatile memories 15, 16. The accounting data includes a value of credit, an accumulated total of value 15 used by the meter in franking mail items, a count of the number of mail items franked by the meter and a count of the number of mail items franked with a postage charge in excess of a predetermined value. The value of credit may be a value of credit available for use by the meter and 20 stored in a descending credit register. The accumulated total value used by the meter is stored in an ascending tote register, the count of items is stored in a piece count register and the count of items franked with a postage charge in excess of a predetermined value is 25 stored in a large items register. Alternatively, if desired, instead of a descending register storing a value of credit available for use by the meter, a total value of credit entered into the meter may be stored in an ascending credit register.

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As is well known in the postage meter art, each of the registers referred to hereinbefore for storing accounting data is replicated in order to enable integrity of the accounting data to be maintained even in the event of a 35 fault or termination of power to the meter during a franking operation. Two replications of each of the registers are provided in each of the memory devices 15,

16.

A motor controller 17 is controlled by the microprocessor 10 to control operation of motors 18 driving feeding means 5 (not shown) for feeding a mail item past a digital print head 19. The digital print head 19 may be an impact print head in which print elements are impelled selectively to impact with an ink ribbon to transfer ink to a mail item or any other form of digital print head and for example 10 may be a non-impact print head. It is preferred to use a non-impact print head such as a thermal print head operating as described hereinafter. The thermal print head includes a plurality of selectively energisable thermal printing elements 20. Sensors 21 are provided to 15 sense and monitor feeding of the mail item. The sensors provide signals to the microprocessor to enable the microprocessor to control feeding of the mail item and to energise selectively the thermal print elements 20 of the print head at appropriate times as the mail item is fed 20 past the print head. As the mail item is fed past the thermal printing elements 20 of the print head 19 during a printing operation, the microprocessor outputs on line 22, in each of a series of printing cycles, print data signals selecting those ones of the printing elements 20 which 25 are to be energised in each respective printing cycle. A pulse of electrical power is supplied to the selected thermal printing elements from a power source 23 when a strobe signal is supplied by the microprocessor on a line 24 to the print head. When printing a bar-code, a 30 plurality of adjacent thermal printing elements are energised in selected printing cycles such as to print narrow and wide bars as required to represent data. The bars may all be of the same length in which case the same number of thermal printing elements are energised in each 35 of the selected printing cycles. However when it is desired to print bars of selected different lengths, the number of thermal printing elements energised in each

selected printing cycle is selected to correspond to the required length of bar to be printed.

It will be appreciated, as is well known in the postage meter art, that the postage meter must operate in a secure manner and be protected from attempts to use the meter fraudulently for example by utilising the postage meter to print franking indicia on mail items for which no corresponding postage charge has been accounted for by the accounting means. Accordingly those parts of the postage meter required to be secured against unauthorised tampering are housed in a secure housing 28.

In so-called prepayment operation of a postage meter, each time a franking operation is to be performed, the micro-processor carries out a routine in which a determination is made as to whether the value of credit in the credit register is sufficient to permit the franking operation in respect of the required postage charge for a mail item to be performed. If the value of credit in the credit register is sufficient, the franking operation is continued and the accounting data in the registers is updated to account for the postage charge and the franking indicia is printed. However if the value of credit in the credit register is not sufficient to permit the franking operation in respect of the required postage charge to be performed, the operation is terminated and the franking indicia is not printed. Where a value of credit available for use in franking is stored in a descending register, the check as to sufficiency of the credit available is effected by a determination of whether the postage charge is less than the credit value. Where a total value of credit is stored in an ascending credit register the check as to sufficiency of credit is effected by a determination of whether the total value of credit is at least equal to the sum of the postage amount and the accumulated total value in the tote register.

In addition to the security against fraudulent attempts to print postage indicia on mail items provided by the secure construction of the postage meter, additional security in respect of the postage indicia and for the postage amounts 5 represented thereby may be provided by the data included in the indicia. In order to provide security in the indicium itself, data to be printed in the indicium is encrypted to generate encrypted information and the data together with the encrypted information is printed on the 10 mail item. The encryption of the data is effected using an algorithm and a secret key so that the encrypted information is not predictable from the data printed in the indicia. The validity of an indicium can be verified by carrying out the same encryption of the printed data 15 and then comparing the resultant encrypted information with the encrypted information printed on the mail item. If the comparison is successful validity of the indicium is verified whereas if the comparison is not successful the indicium is regarded as not authentic. The process 20 for generation of the encrypted information if desired may be a reversible encryption process whereby the encrypted information can be decrypted to yield the original data. When a reversible encryption process is used, verification of the indicium may be effected by decrypting the 25 encrypted information printed in the indicium and comparing the decrypted information with the original data. Instead of utilising encrypted information for verification of the authenticity of the indicium a digital signature may be used.

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To facilitate verification of the validity of the indicia it is desirable that the data and encrypted information or digital signature in the indicia is of a form which is machine readable. Accordingly the mail items can be fed 35 through reading means to scan the indicia on the mail items and computing means coupled to the reading means

carries out verification checks on the scanned indicia. Conveniently the data and encrypted information are printed and represented as elements of a bar-code. Generally the space available on a mail item in which to print postage information is limited to ensure that the information can be accommodated on mail items of various dimensions. Also the printing resolution for the bars of a bar-code must be such that the imprinted bars of the code, even when printed on envelopes of poor quality paper, can be read reliably by the reading means. As a result there is a practical limit to the number of digits which can be represented by the bar-code in the space available and with the required printing resolution.

In order to provide even a basic level of security required in the indicia it is necessary to include a minimum number of items of postage data and the items of data need to be chosen such that no two mail items, which have been genuinely printed with postage indicia, bear identical indicia. The indicium includes an identification of the manufacturer of the metering apparatus and of the metering apparatus to enable the corresponding key for use in encrypting the data, or to enable generation of a corresponding digital signature, at a checking station to be determined. A preferred example of indicium includes a piece count of the mail items processed by the metering apparatus, the date on which the item has been imprinted and the postage amount. While the items of data referred to hereinbefore are preferred items of data to be included in the indicia, it is to be understood that if desired alternative items or additional items may be included. In addition, as referred to hereinbefore, the indicium includes encrypted information, or a digital signature, generated in dependence upon items of data in the indicium. In the preferred example of indicium, the encrypted information is generated in dependence upon the piece count, the date and the postage

amount.

Since the space in which the indicium can be imprinted is limited, it is necessary to limit the indicium to a number 5 of characters which can be accommodated by bar-code within the limited space. A data item such as meter identification must be unique for each meter in order to ensure that there is no ambiguity in determination of the required key to be used for generating encrypted 10 information or in determination of factors to be used in generation of a digital signature in respect of an indicium. However other items of the data may be represented in a manner which is not necessarily unique for any given value of the data. The present invention 15 provides a manner of representing these other items of data having multi-digit values with a reduced number of digits in a manner which although not necessarily unique to each value of the data item is sufficient to provide distinction between indicia on mail items received at a 20 postal receiving station.

In normal representation of a date, it is necessary to allow for two digits for representation of a day in a month as well as further alphanumeric characters for representation of the month and year. However it is proposed herein to represent all dates in a printed postage indicium by means of a single digit selected from 1 to 9 and 0 in accordance with table 1.

30 Table 1

It will be appreciated that the date on which mail items are received at a mail receiving station is typically the same date as that included in the indicia printed on the mail items. Normally, substantially all of mail received 5 at a postal receiving station is processed within three days and within a maximum of seven days. Accordingly since the single digit representation of the day of the month repeats only every ten days, any mail being processed will bear an indicium in which the single digit 10 representation of date can represent only one date. Only if a mail item were delayed to an extent such that it was still being processed ten or more days after receipt would the single digit representation of date be ambiguous. In 15 practice for normal processing of the mail, apart from months following a month in which there are 31 days, the single digit representation of date as set out in table 1 represents only a single day without any ambiguity. Therefore when any mail item is detected with an indicium 20 in which the single digit date representation is outside a range of date representations of mail currently being processed that detected mail item can be rejected or passed to be checked manually.

The postage amount is usually represented by three or four 25 digits. It is proposed to provide a manner of representing the postage as ranges of postage amounts by single digits. An example of single digit representation of ranges of postage amounts is shown in table 2:-

Table 2

	Digit	Value range (US \$)
5	1	0.01 to 0.19
	2	0.20
	3	0.21 to 0.31
	4	0.32
	5	0.33 to 1.00
10	6	1.01 to 2.00
	7	2.01 to 8.00
	8	8.01 to 16.00
	9	16.01 to 32.00
	0	32.01 to 99.99

15 The major number of mail items have indicia representing postage values in the lower ranges and the single digit representation is biassed toward the lower ranges of values, for example the values up to \$1.00. The inclusion of the postage amount in the indicia is to enable  
 20 detection of attempts to change the postage amount from an amount which has been accounted for by the metering apparatus to a higher amount. While the single digit representation does not permit detection of changes of the postage amount within a range, changes of postage amount  
 25 from one range into another range can be detected. Basic common postage rates for mail may be represented by a single digit value and, as shown in table 2, the single digit values 2 and 4 respectively represent the postage rates 0.20 and 0.32.

30 The single digit representations of data and postage value may be obtained by the use of look-up tables.

Referring now to Figure 2 of the drawings, the figure  
 35 illustrates an example of a format of data items and encrypted information in an indicium. A manufacturer's identification 30 is provided by a single digit, a

metering apparatus identification 31 is provided by six digits, a piece count 32 is provided by five digits, a data representation 33 is provided by a single digit, a postage amount 34 is represented by a single digit and 5 encryption information 35 comprising an encryption of the piece count, the date representation and postage amount representation is provided by two digits. If desired the order of the items of data and information may be changed and the information 35 may be a digital signature instead 10 of encrypted information.

The postage metering apparatus may use the single digit representation of date in the generation of the encrypted information or digital signature and likewise a 15 verification computer at a mail processing station would also use the single digit representation of date for the generation of the encrypted information or digital signature to be compared respectively with the encrypted information or digital signature included in the postage 20 indicium. However if desired, the postage metering apparatus may print the single digit date representation in the indicium but use full date data in the generation of the encrypted information or digital signature. The verification computer then uses the single digit date 25 representation in the indicium to determine the actual date and hence the full date representation. The full date data is then used by the verification computer to generate the encrypted information or digital signature for comparison respectively with the printed encrypted 30 information or digital signature in the indicium. As mentioned hereinbefore although any one value of single digit representation is used to represent several different dates in a month, with the normal receipt and processing of mail, the value of single digit will 35 generally represent only one day in the month. Accordingly from the reading of the single digit representing the day of the month input to the

verification computer, the verification computer is enabled to determine the full date data and thereby generate the encrypted information or digital signature. However ambiguity can arise in respect of the 1st day of a 5 month which follows a month in which there are 31 days. Since both day 1 and day 31 are represented by the same value of single digit there would be ambiguity as to whether the single digit value 1 represented, for example, October 31 or November 1. Accordingly the verification 10 computer is operated to generate the encrypted information or digital signature on the basis of one of the two possible days and, if the comparison of generated and printed encrypted information or digital signatures is not successful, to generate the encrypted information or 15 digital signature on the basis of the other one of the two possible days and repeat the comparison of generated and printed encrypted information or digital signatures.

In an example of using the full date data, assume the 20 metering apparatus is operated on November 12, 1996 to process a mail item. The metering apparatus generates the encrypted information or digital signature on the basis of November 12, 1996 and imprints a mail item with an indicium including the encrypted information or digital 25 signature and a single digit day representation having value 2. If the current date on which the verification computer checks that mail item is November 14, 1996, the single digit date representation value 2 is determined represent the date November 12, 1996. The only other 30 possible day represented by the single digit value 2 would be November 2, 1996 and given the normal processing of mail, this day is too early. Having determined the date of the indicium to be November 12, 1996, the verification computer generates the encrypted information or digital 35 signature based on the date November 12, 1996.

In respect of single postage rates represented by single

digit values, but not ranges of postage rates, for example the postage rates 0.20 and 0.32 represented respectively by single digit values 2 and 4 as shown in table 2, the postage metering apparatus may use the postage rate for 5 generating the encrypted information or digital signature. Upon reading the single digit values 2 and 4, the verification then uses the corresponding postage rates to generate the encrypted information or digital signature for comparison respectively with the encrypted information 10 or digital signature in the indicium. The look-up tables relating to postage rate data in the postage metering apparatus and the verification computer can be updated periodically in accordance with changes in postage rates.

15 Instead of using a postage meter including an integral printer for printing postage indicia on mail items, other metering apparatus may be used. For example a personal computer provided with secure postage metering means and arranged to operate an insecure output printer of the 20 personal computer may be used to print the postage indicia on mail items.

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CLAIMS

1. A mail item bearing a postage indicium including multi-digit data represented by a number of digits less than said multi-digit, the representation of said multi-  
5 digit data being such that at least a range of value of said data can be distinguished from values of said data outside said range.
2. A mail item as claimed in claim 1 wherein the multi-  
10 digit data includes date data comprising a numbered day of a calendar month wherein the numbered day of a month is represented by a single digit from a repeating series of single digit representations.
- 15 3. A mail item as claimed in claim 1 or 2 wherein the multi-digit data includes a range of postage charge data represented by a single digit.
4. Apparatus for metering postage value and printing  
20 postage indicia on mail items including electronic means operative to represent multi-digit data by a number of digits less than said multi-digit and to operate printing means to print an indicium including said data represented by said number of digits.
- 25 5. Apparatus as claimed in claim 4 wherein the electronic means is operative to represent numbered days of a calendar month by a repeating series of single digits and to operate the printing means to print the indicium including a day of a calendar month represented by a corresponding single digit of the repeating series of single digits.
- 35 6. Apparatus as claimed in claim 4 or 5 wherein the electronic means is operative to represent each of a plurality of ranges of postage charges by single digits respectively and to operate the printing means to print

the indicium including a selected range of postage charges represented by a single digit corresponding to said selected range of postage charges.

5 7. A method of printing a postage indicium including the steps of representing multi-digit data by a number of digits less than said multi-digit and printing the indicium including said data represented by said number of digits.

10 8. A method as claimed in claim 7 including the step of representing numbered days of a calendar month by corresponding single digits of a repeating series of single digits and the step of printing the indicium 15 including a single digit representing a predetermined numbered day of the calendar month.

20 9. A method as claimed in claim 7 or 8 including the steps of selecting a required postage charge; representing a range of postage charges including said required postage charge by a single digit; and printing the indicium including the single digit representing the range of postage charges.

25 10. A mail item bearing a postage indicium substantially as hereinbefore described with reference to Figure 2.

30 11. Apparatus for metering postage value and printing postage indicia on mail items constructed and arranged to operate substantially as hereinbefore described with reference to Figures 1 and 2 of the drawings.

12. A method of printing a postage indicium substantially as hereinbefore described with reference to the drawings.



# The Patent Office

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Claims searched: 1-12

Examiner: Tony Rudge  
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## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B6C(CVSA,CVSX

Int Cl (Ed.6): G07G-17/02;17/04

Other: Online: WPI

### Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2226525A	(Pitney Bowes)	1,4 at least
X	GB 2188592A	(Pitney Bowes)	
Y	GB 2306915A	(Pitney Bowes)	
Y	EP 0085385A2	(Pitney Bowes)	
X	US 4743747	(Pitney Bowes)	
X	US 4725718	(Pitney Bowes)	
X	US 4649266	(Pitney Bowes)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
& Member of the same patent family			E Patent document published on or after, but with priority date earlier than, the filing date of this application.